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NOTES ON GEOGRAPHIC DISTRIBUTION

The first documented record of the Critically Endangered adder *Vipera berus* (Linnaeus, 1758) (Serpentes, Viperidae) from the German North Frisian Islands (North Sea) and the northernmost record in Germany

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Abstract. The German North Frisian Islands are naturally void of snakes. Although there were rumors decades ago that the adder *Vipera berus* (Linnaeus, 1758) occurs on these islands, there was no evidence of its presence on any of the islands. In this study the first verified record of *V. berus* on Sylt, the largest of these islands, is documented. This is also the northernmost record of *V. berus* for Germany.

Key words. Europe, island colonization, human-mediated introduction, Sylt, Viperinae

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INTRODUCTION

The three largest of the German North Frisian Islands, Amrum, Föhr and Sylt (in the North Sea), are morainic remains of Pleistocene glaciation surrounded by sand flats and sand dunes (Helle and Winkler 2005). They are all naturally void of snakes (Harbst 2005a; Böhme and Grell 2013). The apparent reason for absence of snakes on these islands is the several-kilometre-wide marshland on the adjacent mainland (Harbst 2005a) that acts as a barrier to snake movement (Mohr 1926; Krütgen 2009; Grosse et al. 2015) (Figure 1).

Colonization of the islands by snakes from the mainland is therefore unlikely (Ahnelt et al. 2021). However, two snake species, native and widely distributed in Schleswig-Holstein (Germany) and in the neighbouring Jutland (Denmark), are known to be able to cross marine waters. These are the adder *Vipera berus* (Linnaeus, 1758) (Grosse et al. 2015) and the semi-aquatic Grass Snake, *Natrix natrix* (Linnaeus, 1758) (Kabisch 1999; Baker 2015; Grosse et al. 2015) (Figure 2).

Although the North Frisian Islands are naturally snake-free, records of snakes from these occasionally appear in the literature, especially for the largest island, Sylt. These records were usually classified as doubtful or questionable (Klinge and Winkler 2005), and the earliest dates of these records are 1970 for *V. berus* (Dierking-Westphal 1981), 2005 for *Natrix tesselata* (Laurenti, 1768) (a single report, based on a single juvenile in reeds shipped from Hungary; Grosse 2012), and 2007 for *N. natrix* (Harbst 2005b; Böhme and Grell 2013). Apparently, only *N. natrix* has so far established a reproducing population on Sylt from specimens accidently introduced with construction material (reed bundles, fascine materials) from south-central Europe (Ahnelt et al. 2021).

Vipera berus is widespread in Germany (DGHT 2019) (Figure 3A) and has a distribution ranging from the British Isles to Japan (Figure 3B). The species is listed in the Red List of the Reptiles of Germany as Critically Endangered (Podloucky et al. 2020). Rare island populations occur on islands in the Baltic Sea, north-eastern Germany (Podloucky et al. 2024). Herein, the first documented record of *V. berus* on an island in the North Sea, north-western Germany is presented. This is the northernmost record in Germany.

METHODS

In a literature review, 12 surveys (from 1926 to 2019) of the herpetofauna of the North Frisian Islands, including Sylt in particular, were examined for records of *Vipera berus* (Table 1).

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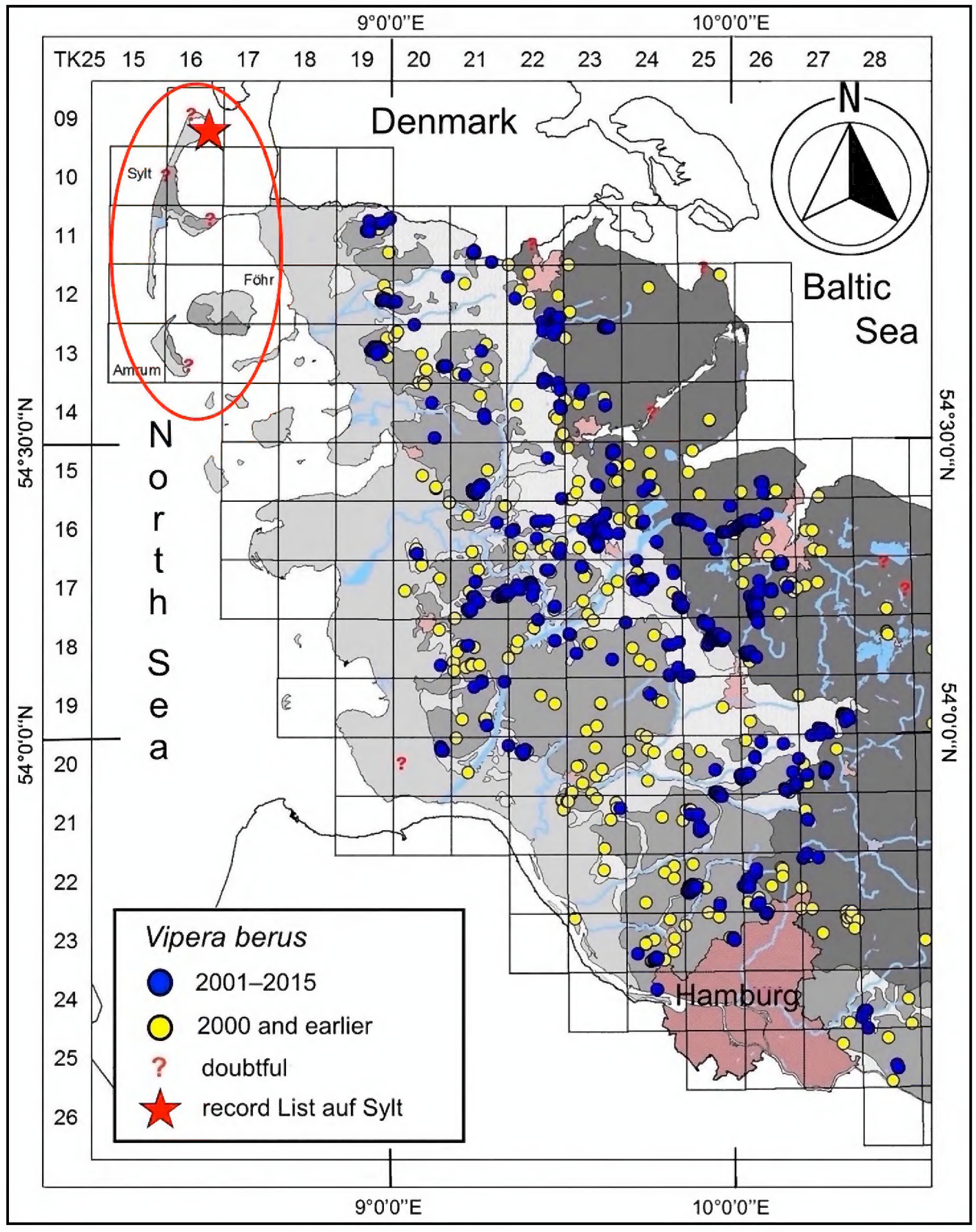

Figure 1. Records of *Vipera berus* in Schleswig-Holstein, north-western Germany. The different shades of grey represent four landscapes of Schleswig-Holstein, from left to right, the coastal marshland, the Fore Geest, the High Geest, and the Eastern Uplands. Note the lack of records in the coastal marshland (light grey). The North Frisian Islands are circled in red. The red star marks the record at List auf Sylt. The question marks represent doubtful and/or unverified records. Map by A. Klinge, FÖAG e.V., modified.

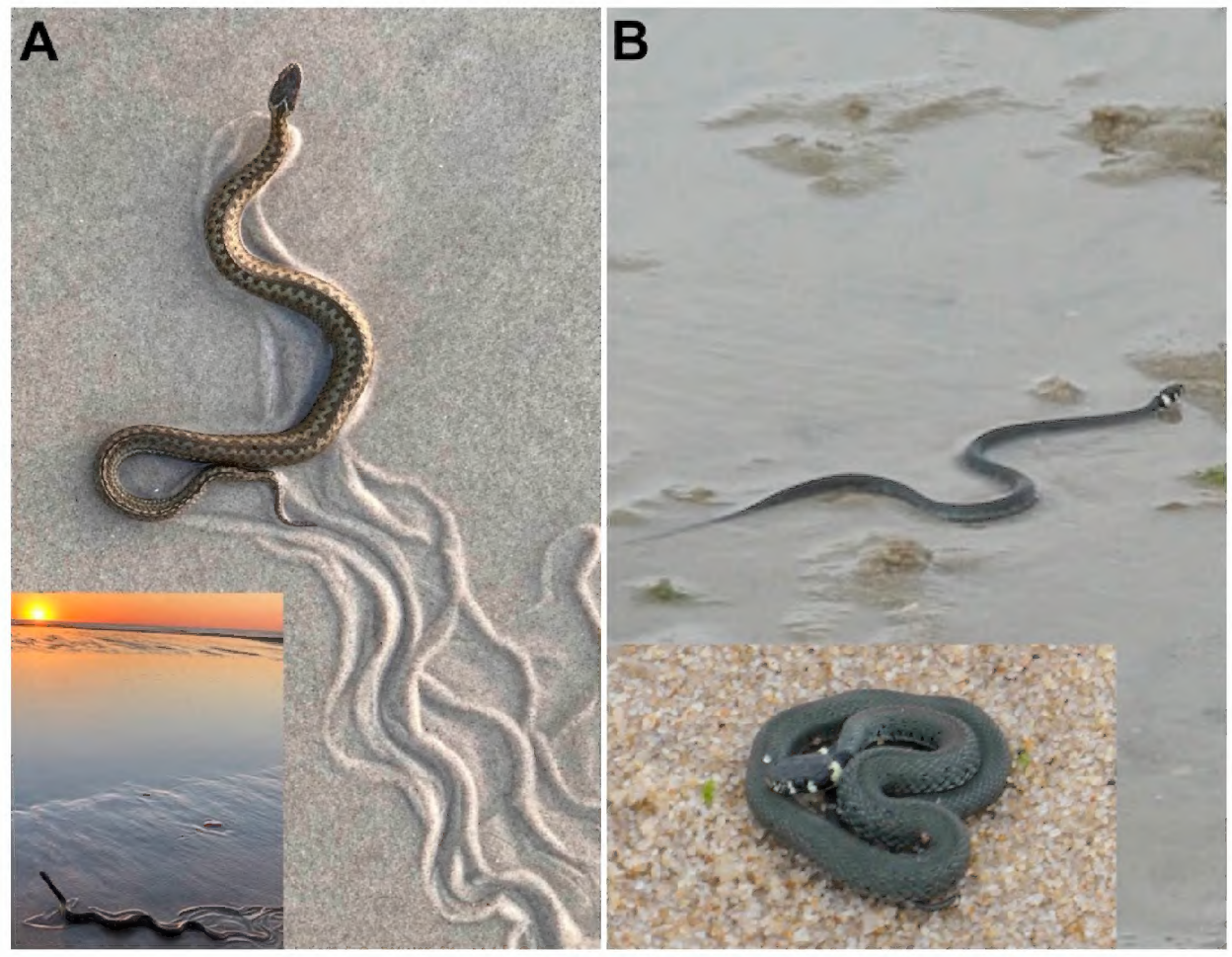

Figure 2. Two examples of the potential for crossing marine waters by snakes at two North Sea beaches. **A.** *Vipera berus* at the west coast of Jutland (Denmark), 22.04.2022 (photos Andreas Clausen), modified. **B.** *Natrix natrix* at the north of the island Sylt (Germany), 24.05.2020 (photos Rainer Borcherding), modified. Inserts in **A** and **B** show the same specimen. (From https://www.beachexplorer.org/, accessed on: 2024-09-09.)

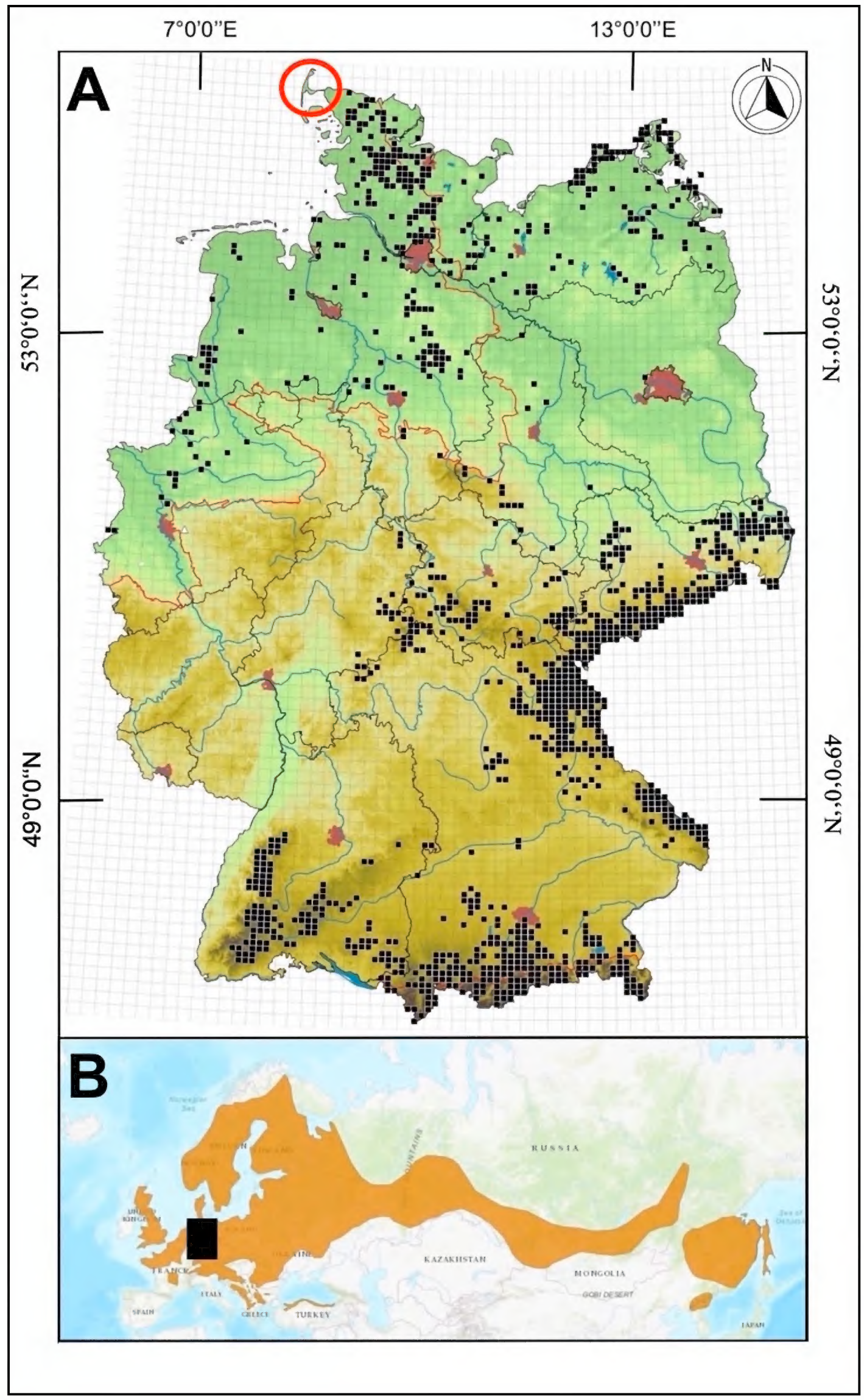

Figure 3. A. Records 2000–2018 (black dots) of *Vipera berus* in Germany. The North Frisian Island Sylt is encircled in red. Map from DGHT (2019, accessed on 2024-12-12). **B.** Geographic range of *V. berus* in Europe and Asia (Munkhbayar et al. 2021). Black rectangle = location of Germany.

On 3 May 2024 a specimen of *V. berus* was photographed on a street on the western border of the village List auf Sylt, Germany (Figure 4). The photo was uploaded on the same day on the online portal beachexplorer.org (2024) by Charlie Esser, a member of a citizen-science project on amphibians and reptiles on Sylt. It was taken by a village resident who had already previously submitted photos of other snake species for the above-mentioned citizen-science project. The adder was moving toward adjacent heathland (C. Esser pers. comm.). No further information on the record is available.

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Table 1. The 12 surveys on the herpetofauna of the North Frisian Islands, 1926–2019, and the occurrence of *Vipera berus* on these islands.

Records	Authors
Not mentioned	Böhme and Grell 2013
Does not occur	Mohr 1926
	Grosse 2006
	Krütgen 2009
Considered doubtful	Warnecke 1961
	Dierking-Westphal 1981
	Klinge and Winkler 2004
	Harbst 2005a
	Klinge and Winkler 2005
	Grosse 2012
	Grosse et al. 2015
	Klinge and Winkler 2019

RESULTS

***Vipera berus* (Linnaeus, 1758)**
Figure 4

New record. GERMANY – Schleswig-Holstein • North Frisian Islands; Sylt • List auf Sylt; 55°01′04″N, 008°25′18″E; 7 m a.s.l.; 03.V.2024; C. Esser obs.; 1 specimen, likely female, based on its brown colouration.

Identification. The individual was identified by the following key characters: dark zigzag band with numerous zigzags on the dorsum including the tail; a dark brown, V-shaped patch on the back of the head, open posteriorly and not in direct contact with the zigzag band on the back; a dark band along each side of the head from the eye to the neck, becoming blotches along the flanks; a compact body with a short, thin tail (Podloucky et al. 2024). The species occurs naturally on the neighbouring mainland of Schleswig-Holstein, Germany (Figure 1).

The species most similar to *V. berus* is Meadow Viper, *V. ursinii* (Bonaparte, 1835). This species is rare and one of the most threatened reptiles in Europe. Its distribution is fragmented and limited to southern Europe including the Balkan Peninsula (Console et al. 2020). A zigzag band on the back is also characteristic of Nose-horned Viper, *Vipera ammodytes* (Linnaeus, 1758), although this species differs from other European vipers by the fleshy horn on the top of the snout (Happ and Wieser 2008).

DISCUSSION

This photograph is the first documented record of the occurrence of *Vipera berus* on Sylt and is the northernmost record of the species in Germany.

Figure 4. *Vipera berus*, west of the village List auf Sylt on the North Frisian Island of Sylt, Germany, photographed on 3 May 2024. Photo by Charlie Esser, reproduced here with permission. This is the first documented record of *V. berus* on Sylt and the northernmost record in Germany.

Figure 5. *Vipera berus* on Sylt. The red star marks the first documented record on the North Frisian Island of Sylt and northernmost record for Germany at the village List auf Sylt (55°01′04″N, 008°25′18″E). Note the large area of heath, a habitat suitable for adders, to the west of the record. Scale bar = 300 m. (Map from OpenStreetMap, accessed on 2024-10-14).

There is little information concerning the photo documentation of *V. berus* on Sylt. The specimen was photographed in the west of the village List auf Sylt "near the Old School" (Figure 5). No further information on the location is available.

The origin of this specimen is unknown. Possibly it arrived recently with transported material such as reeds or fascines, or possibly a pet escape or release. The locality where the photo was taken is near an area of heather (Figure 5).

Some herpetological surveys of the North Frisian Islands of Denmark and Germany explicitly state that *V. berus* does not occur on these islands (Mohr 1926; Fog et al. 1996; Grosse et al. 2006; Krütgen 2009) or did not mention the species (e.g. Böhme and Grell 2013). Three records dated 1969–1975 from Sylt were unverified (Klinge and Winkler 2004) and were classified as doubtful shortly afterwards by the same authors (Klinge and Winkler 2005). A single record of *V. berus* from the 1950s on the neighbouring island of Amrum was considered an accidental introduction (Warnecke 1961). All these reports from the North Frisian Islands of *V. berus* are based on oral reports and unverified. No voucher specimens or photographs of these records are known (Table 1).

The most recent information on the distribution of *V. berus* in Germany, including a distribution map with records from 1900–2018, was by Podloucky et al. (2024: 12). These authors explicitly mentioned island populations of this species, but only from islands in the Baltic Sea (Podloucky et al. 2024: 10) and with no mention of records from the North Frisian Islands. The origin of snakes on the North Frisian Islands is unclear; introductions with construction material such as reed bundles and fascine material seem to be the most likely explanation (summarized by Ahnelt et al. 2021).

The sighting of *V. berus* at the western border of the village List auf Sylt was close to a large area overgrown with heather and some bushes, a habitat that is naturally frequently colonized by this snake (Mohr 1926; Harbst 2005a; Podloucky et al. 2024). This heathland extends west of the village, and would provide a suitable habitat for *V. berus* (Figure 5).

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ADDITIONAL INFORMATION

Conflict of interest

The author declares that no competing interests exist.

Ethical statement
No ethical statement is reported.

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Data availability
All data that support the findings of this study are available in the main text.

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